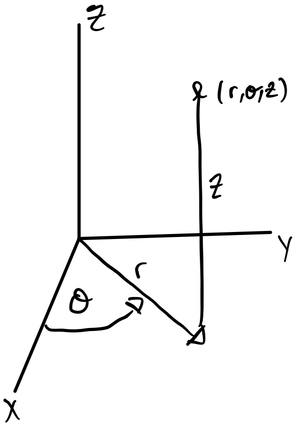


$(x,y,z) = (-8,8,8)$ to (r,θ,z)

$r^2 = x^2+y^2$
$r^2 = -8^2+8^2$
$r^2 = 128$
$r = \sqrt{128}$

$\tan\theta = \frac{y}{x}$
$\theta = \tan^{-1}\left(\frac{8}{-8}\right)$
$\theta = \tan^{-1}(-1)$
$\theta = -\frac{\pi}{4}$

$(8\sqrt{2}, \frac{3\pi}{4}, 8)$

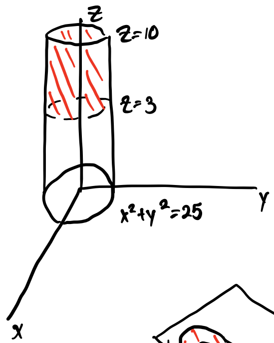
15.8.1 $\iiint_E \sqrt{x^2+y^2}\, dv$

$x^2+y^2=25$
$z=3 \to z=10$

$\int_3^{10}\int_0^{2\pi}\int_0^5 \sqrt{r^2}\; r\; dr\,d\theta\,dz$

$\int_3^{10}\int_0^{2\pi}\int_0^5 r^2\; dr\,d\theta\,dz$

$0 \le r \le 5$
$0 \le \theta \le 2\pi$
$3 \le z \le 10$



15.8.2 $\iiint_E x\, dv$

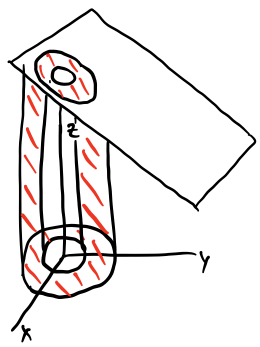
$z=0$, $z=x+y+9$
$x^2+y^2=9$, $x^2+y^2=16$

$x = r\cos\theta$
$y = r\sin\theta$

$3 \le r \le 4$
$0 \le \theta \le 2\pi$

$\int_0^{2\pi}\int_3^4\int_0^{x+y+9} x\; r\; dz\,dr\,d\theta$

$\int_0^{2\pi}\int_3^4\int_0^{r\cos\theta+r\sin\theta+9} r^2\cos\theta\; dz\,dr\,d\theta$



15.8.3 $\iiint_E x^2\, dv$

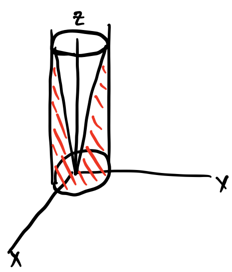
Inside $x^2+y^2=4$
Above $z=0$
$z^2 = 9x^2+9y^2$

$\int_0^{2\pi}\int_0^2\int_0^{3r} r^3\cos^2\theta\; dz\,dr\,d\theta$

$z = \sqrt{9x^2+9y^2}$
$z = \sqrt{9(x^2+y^2)}$
$z = \sqrt{9r^2}$
$z = 3r$

$\int_0^{2\pi}\int_0^2\int_0^{3r} r^2\cos^2\theta\; r\; dz\,dr\,d\theta$

$\int_0^{2\pi}\int_0^2\int_0^{3r} r^3\cos^2\theta\; dz\,dr\,d\theta$



$I = \int_0^{2\pi}\int_3^4\int_0^{r\cos\theta+r\sin\theta+9} r^2\cos\theta\; dz\,dr\,d\theta$

$\int_0^{2\pi}\int_3^4 r^2\cos\theta\; z\Big|_0^{r\cos\theta+r\sin\theta+9} dr\,d\theta$

$\int_0^{2\pi} r^2\cos\theta\int_3^4 r\cos\theta+r\sin\theta+9 \quad dr\,d\theta$

$\int_0^{2\pi}\int_3^4 r^3\cos^2\theta + r^3\cos\theta\sin\theta + 9r^2\cos\theta \; dr\,d\theta$

$\int_0^{2\pi} \frac{r^4}{4}\cos^2\theta + \frac{r^4}{4}\cos\theta\sin\theta + 3r^3\cos\theta\Big|_3^4 \; d\theta$

$\frac{1}{2}+\frac{1}{2}\cos 2\theta$

$$\int_0^{2\pi} \cos^2\theta + \cos\theta\sin\theta + \cos\theta \; d\theta$$

$u = 2\theta$
$du = 2\,d\theta$
$\frac{1}{2}du = d\theta$

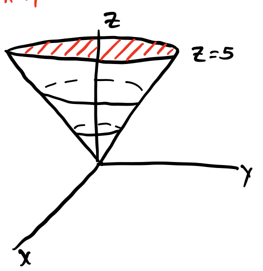
$$\frac{175}{4}\int_0^{2\pi} \cos^2\theta \; d\theta + \frac{175}{4}\int_0^{2\pi} \cos\theta\sin\theta + 111\int_0^{2\pi} \cos\theta \; d\theta$$

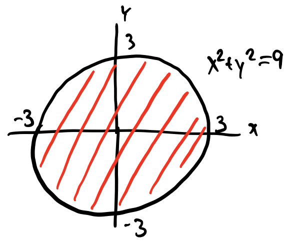
$$\frac{175}{4}\int_0^{2\pi} \frac{1}{2}+\frac{1}{2}\cos 2\theta \; d\theta + \frac{175}{4}\int_0^{2\pi} \cos\theta\sin\theta + 111\int_0^{2\pi} \cos\theta \; d\theta$$

15.8.4 $\displaystyle\int_{-3}^{3}\int_{-\sqrt{9-y^2}}^{\sqrt{9-y^2}}\int_{\sqrt{x^2+y^2}}^{5} xz \; dz\,dx\,dy$

$z = \sqrt{x^2+y^2}$ $\quad x = \sqrt{9-y^2}$ $\quad y = 3$
$z = 5$ $\quad x = -\sqrt{9-y^2}$ $\quad y = -3$

$0 \le \theta = 2\pi$
$0 \le r \le 3$
$r \le z \le 5$





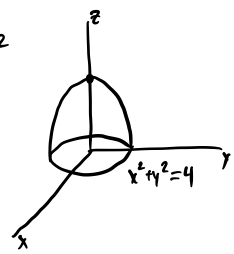
$$\int_0^{2\pi}\int_0^{3}\int_r^{5} xz \; r \; dz\,dr\,d\theta$$

$x = r\cos\theta$

$$\int_0^{2\pi}\int_0^{3}\int_r^{5} r^2\cos\theta \, z \; dz\,dr\,d\theta$$

15.8.5 $\displaystyle\int_{-2}^{2}\int_{0}^{\sqrt{4-x^2}}\int_{0}^{4-x^2-y^2} \sqrt{x^2+y^2} \; dz\,dy\,dx$

$x^2+y^2 = r^2$



$$\int_0^{2\pi}\int_0^{2}\int_0^{4-r^2} r \; r \; dz\,dr\,d\theta$$

$$\int_0^{2\pi}\int_0^{2}\int_0^{4-r^2} r^2 \; dz\,dr\,d\theta$$